

CAPACITY UPGRADE OF GUNUNG SALAK GEOTHERMAL POWER PLANT PROJECT, INDONESIA

3RD VERIFICATION REPORT



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Designated Operational Entity (DOE)

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Summary:

PT. Indonesia Power has commissioned the TÜV Rheinland (China) Ltd to carry out the verification of the Project "Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia" in Awibengkak-Ratu, Indonesia with regard to the requirements of VCS Version 3.3 Standard.

The project activity is the capacity up gradation of 3x55MW turbine to 3x60MW of the Geothermal power plant. The increase in capacity of 15MW electricity will be supplied to the JAMALI Grid of Indonesia.

Reporting period: From 2011-04-01 to 2012-07-31 (both days included)

In the course of the verification 3 Corrective Action Requests (CARs), 4 Clarification Requests (CLs) were raised and closed successfully. Furthermore No FAR is raised which need to be checked during next verification period.

The verification is based on the draft monitoring report/P01/, the monitoring plan as set out in the validated PD/B02/, the validation report/B02/, emission reduction calculation spreadsheet/P04/ and supporting documents made available to the TÜV Rheinland (China) Ltd by the project participant. The TÜV Rheinland (China) Ltd has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

As the result of the 3rd periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV Rheinland (China) Ltd herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Year	BE _y	PE _y	LE _y	Emission Reductions E _{Ry} (tCO _{2e})
2011-04-01 to 2011-12-31	144,206	51,866	0	92,340
2012-01-01 to 2012-07-31	140,345	28,950	0	111,395

Total Emission reductions: 203,735 t CO₂ equivalents (rounded down value)

Table of Contents

1	Introduction.....	6
1.1	Objective	6
1.2	Scope and Criteria.....	6
1.3	Level of assurance	6
1.4	Summary Description of the Project	6
2	Validation Process, Findings and Conclusion	8
2.1	Validation Process (Not Applicable for already validated project).....	8
2.2	Validation Findings	9
2.2.1	Gap Validation	9
2.3.2	Methodology Deviations	9
2.3.3	New Project Activity Instances	9
2.4	Validation Conclusion.....	9
3	Verification Process	9
3.1	Method and Criteria	9
3.2	Document Review	10
3.3	Interviews	10
3.4	Site Inspections	12
3.5	Resolution of Any Material Discrepancy.....	13
4	Verification Findings	14
	Accuracy of emission reduction or Removal Calculations.....	14
4.1	Project Implementation Status/ Remaining issues, including any material discrepancy.....	14
4.2	Accuracy of GHG Emission Reduction or Removal Calculations.....	17
4.3	Quality of evidence to determine emission reductions or Removal	18
4.4	Management and Operational System	35

5	Verification conclusion	37
6	References:	38

Annex-I - Abbreviation

1 INTRODUCTION

1.1 Objective

The purpose of this verification, by independent checking of objective evidence, is as follow.

- To verify that the project is implemented as described in the VCS-PD/B02/;
- To assess the implementation of the monitoring plan (MP) content in the VCS-PD/B02/;
- To assess the project's compliance with other relevant rules, including the host country (Indonesia) legislation;
- To confirm that the monitoring system is implemented and fully functional to generate voluntary emission reductions (VERs / VCUs) without any double counting; and
- To establish that the data reported are accurate, complete, consistent, transparent and free of material error or omission by checking the monitoring records and the emissions reduction calculation.

1.2 Scope and Criteria

The verification of this project is based on the validated project document/B02/, the monitoring report/P02/, emission reduction calculation spread sheet/P04/, supporting documents made available to the verifier and information collected through performing interviews/P09/ and during the on-site assessment. Furthermore publicly available information was considered as far as available and required.

The TÜV Rheinland (China) Ltd has employed a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generation of emission reductions.

1.3 Level of assurance

The verification has been planned and organized to achieve a

☒ Reasonable level of assurance

☐ Limited level of assurance

1.4 Summary Description of the Project

The project activity is a capacity up gradation of geothermal power plant from 3x55MW to 3x60MW which leads to increase in power production of 15MW. The steam required for the energy generation is supplied under Energy Sales Contract (ESC) from Chevron Geothermal Indonesia. The capacity up gradation is done by modifying turbine and gas ejectors. The generated electricity is supplied to the Jawa-Madura-Bali grid (JAMALI grid, Indonesia). The steam from geothermal site is utilized for operation of the turbine which is coupled to generator to produce electricity.

The proposed project would generate electricity through steam generated from geothermal resource thereby displacing, electricity generated using existing fossil fuel based power plants or future capacity additions in the country.

The estimated electricity supplied to the grid from the project activity is 213,959 MWh per year¹. The estimated GHG emission reduction is 1,125,224 tCO_{2e}² for the chosen ten year crediting period. The latitude and longitude of the project activity are mentioned below in the table 1.1,

Table 1-1:

Project Participants:	PT. Indonesia Power
Baseline and monitoring methodology:	ACM0002 -“Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, Version 07
Location of the project activity:	Awibengkok-Ratu area, Sukabumi district, West Java province, Indonesia
Project’s crediting period:	2006-04-01 to 2016-03-31 (10 years fixed crediting period)
Period verified in this verification:	2011-04-01 to 2012-07-31 (Both days included)
Project registered with CDM/Other mechanisms	Not Applicable since the project is not applied for CDM

As part of the site visit the verification team was able to confirm that the project implementation is in accordance with the project description contained in registered VCS PD of 2009-07-10.

The project activity is located in Sukabumi district/B13/ in West Java Province of Indonesia. The key parameters of the project are given in table 1.2:

Table 1.2: Technical data of the project/P10/

Description	Units	Operation condition
No of units	Nos	3

¹ As per the registered VCS PD

² As per the registered VCS PD

Installed Turbine capacity	MW	3 x 60
Installed Generator Capacity	MW	3 x 55
Rated Generator capacity	kVA	68,750
Power Factor	-	0.8
Over Load of generator	%	20

The project activity is a brown field geothermal power project with capacity up gradation which generates electricity and supplies to the JAMALI grid. The location and ownership of the geothermal power plant, as verified during the site visit and document review is summarized below Table 1.3:

Table 1.3:

Ownership/P06/	Installed capacity (MW)/P06/	Physical Location/P09/	GPS Co-ordinates/B13/
PT. Indonesia Power	3 x 60	Awibengkong-Ratu area, Sukabumi district, west java province, Indonesia	06° 44' 26" S 106° 38' 28" E

During the monitoring period 2011-04-01 to 2012-07-31 (both days included) the total emission reduction comes to **203,735 tCO_{2e}**.

The on-site visit was carried out on 2012-11-26 and 2012-11-27. All the members of the Verification team attended the site visit and investigated the operation and monitoring of the geothermal power plant of PT. Indonesia Power.

2 VALIDATION PROCESS, FINDINGS AND CONCLUSION

2.1 Validation Process (Not Applicable for already validated project)

- *Method and Criteria:*
- *Document Review:*
- *Interviews:*
- *Site Inspections:*
- *Resolution of Any Material Discrepancy:*

The project is already registered under VCS with the project ID: VCSR144, further for above points, please refer to VCS Final Validation report of “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia” dated 2009-07-14 by TÜV NORD CERT GmbH and submitted to VCSA.

2.2 Validation Findings

2.2.1 Gap Validation

There was no gap validation of the project conducted during this monitoring period. Verification of this project is based on already validated project document /B02/ dated 2009-07-10, Validation report dated 2009-07-14 /B02/ the Validation statement dated 2009-07-14/B02/, first verification monitoring report dated 2009-10-27/B04-1/, first verification statement dated 2009-10-27/B04-1/ and first verification report dated 2009-10-26/B04-1/ and second verification monitoring report dated 2012-04-24/B04-2/, second verification statement dated 2012-06-04/B04-2/..

2.3.2 Methodology Deviations

No methodology deviation foreseen during the current monitoring period.

2.3.3 New Project Activity Instances

No new project activity instances are identified or proposed by the project proponent during the current monitoring period.

2.4 Validation Conclusion

The conclusions of this report show, that the project, as it was described in the project documentation, is in line with all criteria applicable for the validation against the VCS version 2007.1 standards without any qualifications or limitations. Please refer Validation report dated 2009-07-14 /B02/.

3 VERIFICATION PROCESS

3.1 Method and Criteria

The verification of the project consists of the following steps:

- Contract review sheet (CRS)
- Appointment of team members and technical reviewers
- Receiving the monitoring report from PP
- Desk review of the Validated PD, Monitoring Report and Emission reduction calculation spread sheet submitted by the client and additional supporting documents
- Verification planning,
- On-Site assessment,
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,

- Draft verification reporting
- Resolution of corrective actions (if any)
- Final verification reporting
- Technical review
- Final approval of the verification.

The sequence of the verification is given in the table 3.1 below:

Table 3.1: Verification sequence

Topic	Time
Approved under VCS validation	2009-07-14
First verification issuance	2009-10-27
Second Verification issuance	2012-06-04
Third verification on-site visit	2012-11-26 and 2012-11-27
Final Draft verification reporting	2012-12-03
Final reporting finalized	2012-12-10
Technical review on final reporting finalized	2012-12-24

The main verification steps are described below.

3.2 Document Review

The submitted MR (version 1)/P01/ and supporting background documents related to the project design and Monitoring plan was reviewed.

Furthermore, the verification team used additional documentation by third parties like host party legislation, technical reports, annual report referring to the project design or to the basic conditions and technical data. The references used in the course of this verification are summarized in section 6.

3.3 Interviews

The verification team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for the VCS 3.3.

During verification the verification team has performed interviews to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in Table 3-2.

Table 3-2: Interviewed persons and interview topics

	Date	Name	Organization	Topic
/I-01/	2012-11-26 and 2012-11-27	Mr. Doni Bakar	Power Plant Manager, PT.Indonesia Power	Discussion on implementation of the project activity, organization structure, internal audit and monitoring roles and responsibilities. Discussion on the monitoring procedure for each parameter and the measurement technique including Information flow (from data generation, aggregation, to recording, calculation and reporting). Discussion on calibration frequency of revenue meter, back up meter, steam flow meter, NCG analysis, outages, usage of DG during blackouts, updated SOP, change in energy meter, swap of energy meter etc
	2012-11-26 and 2012-11-27	Mr. Iwan Kurniawan	AMA Engineer, Kimia Kamojang, PT.Indonesia Power	
	2012-11-26 and 2012-11-27	Mr. Sugimin	Electrical, PT.Indonesia Power	
	2012-11-26 and 2012-11-27	Mr. Alam Bazar	Expert Geothermal and Hydro, PT.Indonesia Power	
	2012-11-26 and 2012-11-27	Mr. Faisal	GSL, PT.Indonesia Power	
	2012-11-26 and 2012-11-27	Mr. Vicky	PT.Indonesia Power	
	2012-11-26 and 2012-11-27	Mrs. Anna Reani	Vice President, PT.Indonesia Power	
	2012-11-26 and 2012-11-27	Mr. Yuansah	Chemical Staff, PT.Indonesia Power	
/I-02/	2012-11-26 and 2012-11-27	Mr. Leonardo Sidabalok	Assistant Project Manager, South Pole	Discussion on the monitoring report in particular compliance of implemented monitoring plan with the applied monitoring methodology and the registered monitoring plan including data cross check for each parameter and discussion on final reporting of the monitoring parameters. Discussion on the monitoring procedure for each parameter and the measurement technique

				including Information flow. QA/QC procedures, training.
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3.4 Site Inspections

As most essential part of the verification exercise it is indispensable to carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. The verification team has carried out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore, the on-site assessment was conducted and monitoring data were checked with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include, but are not limited to:

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

The on-site visit was carried out on 2012-11-26 and 2012-11-27. All members of the Verification team attended the site visit and investigated the operation and monitoring of the Geo-thermal power plant of PT. Indonesia Power.

On the basis of a competence analysis and individual availabilities, a verification team, consisting of one team leader, one technical expert and one local expert as well as the Technical Review personnel were appointed.

The list of involved personnel, the tasks assigned and the qualification status are summarized in the table 3-3 below.

Table 3.3: Involved Personnel

Verification Team			Type of Involvement						
Full name	Affiliation	Appointed for Sectoral Scopes (Technical Areas)	Supervising the work	Desk review	Site Visit + Interview	Report and protocol Writing	Technical Expert Input	Reporting Support	Technical Reviewer
	TÜV Rheinland								

Mr. R. Murali	India	1.2, 3.1	X	X	X	X	X	X	
Mr. Shailendra Kewat	India	1.2, 13.1		X		X		X	
Mr. Ramaiyer Ramachandran	India	1.1, 4.5							X

The following performance records was checked during verification process, Sales invoice receipt/P08/, monthly energy records/P07/, steam generation log records/P15/, DG operational records/P12/, NCG analysis report/P13/, shut down hour detail records/P09/, calibration records/P05/ of all the monitoring instruments, storage records/P09/, training records/P16/, SOP/P14/, and basis for emission reduction calculation/P04/. All the values mentioned in the emission reduction spread sheet were based on the reviewed documents. These data values and other information related to project performance including calibration and meter testing details are available in the form of hard copy and records duly archived and maintained as per the quality assurance/quality control procedure specified as a part of monitoring plan given in the validated VCS-PD.

3.5 Resolution of Any Material Discrepancy

Material discrepancies identified in the course of the verification are addressed either as CARs, CLs or FARs.

A **Corrective Action Request (CAR)** is established where:

- Mistakes have been made in assumptions, application of the methodology or the project documentation which will have a direct influence the project results,
- The requirements deemed relevant for verification of the project with certain characteristics have not been met or
- There is a risk that the project would not be registered or that emission reductions would not be able to be verified and certified.

A **Clarification Request (CL)** will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

A **Forward Action Request (FAR)** will be issued when certain issues related to project implementation should be reviewed during the first verification.

A detailed list of the CARs CLs and FAR raised and discussed in the course of this verification is included in the next section 4 of this report.

4 VERIFICATION FINDINGS

In this section the assessments and findings from the desk review of the VCS-PD, site visit, interviews and supporting documents as well as the final assessments are summarized. Table 4-1 includes an overview of all raised CARs, CLs and FARs.

Table 4-1: Overview of CARs, CLs and FARs issued

No.	Topic / Chapter	CAR	CL	FAR
4.1	Project implementation /Remaining issues, including any material discrepancy	1	0	0
4.2	Accuracy of emission reduction or Removal Calculations	1	2	0
4.3	Quality of evidence to determine emission reductions or Removals	1	2	0
4.4	Management and operational system	0	0	0
-	SUM	3	4	0

4.1 Project Implementation Status/ Remaining issues, including any material discrepancy

The project activity is a capacity up gradation of geothermal power plant from 3x55MW to 3x60MW which leads to increase in power production of 15MW. The steam required for the energy generation is supplied under Energy Sales Contract (ESC) from Chevron Geothermal, Indonesia. The capacity up gradation is done by modifying turbine and gas ejectors. The generated electricity is supplied to the Jawa-Madura-Bali grid (JAMALI grid, Indonesia). The steam recovered from Geo-thermal energy is used for producing electricity which is a renewable form of energy.

The project was registered under “Voluntary Carbon Standards Version2007.1”. All the raised CARs, CLs have been closed successful during validation stage. However during first verification there were three FARs highlighted which was closed during the second verification period. The Forward Action Request was regarding frequency of NCG analysis, QA/QC of Trips, unrecorded steam flow readings and irregularities in monitored values, calibration frequency of energy meters and other monitoring equipment’s as per the updated Standard Operation Procedure. The same is double checked during third verification and the procedure followed at project site are in line with the VCS-PD and VCSA. Hence no FAR is raised during the third verification period.

The project’s baseline emissions are determined as the product of the net electricity supplied to the JAMALI grid by the project and the validated ex-ante emission factor/P18/ (as per the registered VCS-PD/B02/). Project emissions due to the project activity are considered as per the requirements of ACM 0002 methodology/B01/. Leakage is considered to be zero as per the applied methodology/B01/. The same was also confirmed during on-site visit/P09/ and comply with the requirements of para 17 (b) of “General guidelines to SSC CDM methodologies”.

Herewith, the Verification Team summarizes major changes between initial VCS Monitoring Report and final version of Monitoring Report for submission as follows:

Subject	Initial Monitoring Report (MR)	Correction to initial MR in the final MR submission for issuance with DOE assessment and reason of acceptance.
Consistency		
MR (project title / participants involved/ project location / reference numbers / report date and version etc)	Project Title: Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia Participants involved: PT. Indonesia Power and South Pole Carbon Asset Management Ltd. (as carbon credit buyer) Project location: Awibengkok-Ratu area of Gunung Salak Geothermal field surrounded by Halimun Salak national park, which is administratively part of Bogor District and Sukabumi District, West Java Province, Indonesia	Project Title: No change Participants involved: No change Project location: No Change
Methodologies (title and version numbers) MR and its version	Methodology Title & version number: ACM0002 “Consolidated methodology for grid-connected electricity generation from renewable sources, version 07	No change
CER calculations (formula applied/ amount of emission reduction)	$BE_y = (EG_y - EG_{baseline}) \cdot EF_{grid,CM,y}$ $EG_{baseline} = EG_{historical} \text{ until } Date_{BaselineRetrofit}$ $EG_{baseline} = EG_{y,on/after Date_{BaselineRetrofit}}$ $PE_y = PES_y + PEF_{f,y}$ $PES_y = (w_{main,CO_2} + w_{main,CH_4} \times GWP_{CH_4}) M_{s,y}$ $PE_{f,y} = \sum_i F_{C,i,y} \times COE_{i,y}$ $COE_{i,y} = NCV_{i,y} \times E_{C,i,y}$	BEy mentioned as zero have been revised to show the actual figure. The negative value of BEy have been calculated and added in this revised MR. Hence, the total ERs have been reduced from 216,675 tCO ₂ become 203,735 tCO ₂ based on conservative approach.

	$BE_y = 297,491$ $PE_y = 80,816$ $EG_y = BE_y - PE_y - LE_y$ $ER_y = 216,675 \text{ tCO}_2\text{e}$	
Please refer to Table 7 (CAR/CL) of this report for details of each change between initial MR and the final MR for submission. The Verification Team has carried out the verification process based on the initial MR and raised CARs/CLs against the project by issuing the verification protocol. With the updated information and corrections done on final MR, the PP has addressed all the CARs /CLs that were raised by the Verification Team. It is concluded that the Verification Team has reviewed the project in line with the VVM (http://v-c-s.org/sites/v-c-s.org/files/VCS%20Validation%20Verification%20Manual%2C%20v3.0.pdf)/VCS version 3.3 and all the evidence, corrections, justifications and updating done on the final MR with respect to CARs /CLs raised are accepted and closed by the Verification Team, issuing the positive verification opinion for project registration. No FAR is raised. CAR-01 is raised.		

Final Assessment:

During the verification an on-site visit was carried out. By means of the on-site visit and interview with the PP/IM01/&IM02/ it is checked that the realized technology, the project equipment's, the project design has been implemented and operated as described in the validated VCS-PD. During third verification period there is a swapping of energy meter between Unit #1 and Unit #3 on 2012-06-01/P09/ and there is a change in energy meter reported for Unit#1. The reasons are analyzed for swapping and change in revenue meter are verified at the project site by reviewing documentary evidenced and information collected during the site visit. The main reason for swapping is malfunctioning of Ethernet LAN of revenue meter which couldn't deliver the readings of generated electricity at their head-quarters office in Jakarta and also deviation of energy readings between PP revenue meter and PLN owned revenue meter. Hence PP has taken corrective action and swapped the energy meter of Unit#1 and Unit#3 to minimize the deviation. However for Unit#1 the PP has changed the revenue meter with new serial number MT-1006A500-01 on 2010-08-10 and the new revenue meter has a higher data storage capacity of 10 MB when compared to old energy meter. During the corrective action period, the energy readings are recorded from back up meter of PLN Owned meter during the period from 2012-02-16 to 2012-06-01 for Unit#1, Unit#2 and Unit#3/P09/. The SOP has been updated to include the procedure of meter readings in case of mal functioning PO revenue meter. Except some routine maintenance, planned and forced outages there are no major blackouts during the third verification. All the records are verified and it is concluded by the DOE that all the above identified outages didn't affect the applicability of the methodology or its monitoring plan. There is no

other change is envisaged in the project activity. These facts have been verified during site visit by interviewing the monitoring personnel's and review of documents. The total shut down and blackouts during the third verification period are 1015.20 hours.

All FARs raised in during the first verification is closed for during the second verification and no FAR is raised during the current monitoring period. No remaining issues/ discrepancies in previous verification of the project are left out.

The amount of emission reductions over the monitoring period is 203,735 tCO_{2e}. Hence as seen above, there is no change in the implementation of the project activity with the description contained in the VCS PD. In accordance with VCS requirements the verification team reviewed the registered VCS PD, including the monitoring plan and the corresponding validation report, the applied monitoring methodology, relevant decisions from the VCS board and found that the MR for this monitoring period is in line with all the requirements of VCS version 3.3.

No FAR was raised during the current verification period.

☒ Nevertheless, CAR -01, is raised and successfully closed (refer Table 7 for more details).

4.2 Accuracy of GHG Emission Reduction or Removal Calculations

The proposed project uses CDM approved methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", Version 07, which is approved under VCS version 3.3. The application of monitoring methodology is assessed as correct. The reporting and criteria are in line with the requirements of the validated monitoring plan as well as with the applied methodology ACM0002 version 07.

The reporting procedures reflect the requirements of the monitoring plan. The monitoring parameters are recorded as per the monitoring plan. The monitoring plan and Standard Operation Procedure provides detailed information related to the collection and archiving of all relevant data needed to:

- Net electricity generated in MWh taken from Sales receipt invoice for the period covering third verification period.
- Electricity imported from the JAMALI grid in MWh
- Average mass fraction of CH₄ in the produced steam (non-dimensional)
- Average mass fraction of CO₂ in the produced steam (non-dimensional)
- Quantity of delivered steam in tonnes
- Amount of diesel fuel used in tonnes or liters

As most essential part of the verification exercise it is indispensable to carry out an inspection on site in order to verify that the project is implemented in accordance with the applicable criteria. Furthermore the on-site assessment is necessary to check the monitoring data with respect to accuracy to ensure the calculation of emission reductions. The main tasks covered during the site visit include, but are not limited to:

- The on-site assessment included an investigation of whether all relevant equipment is installed and works as anticipated.
- The operating staff was interviewed and observed in order to check the risks of inappropriate operation and data collection procedures.
- Information processes for generating, aggregating and reporting the selected monitored parameters were reviewed.
- The duly calibration of all metering equipment was checked.
- The monitoring processes, routines and documentations were audited to check their proper application.
- The monitoring data were checked completely.
- The data aggregation trails were checked via spot sample down to the level of the meter recordings.

Before and during the on-site visit the verification team performed interviews with the project participants to confirm selected information and to resolve issues identified in the document review.

Final Assessment

All relevant evidences such as calibration certificate/P05/, log records/P12/, /P13/, /P15/, generation report/P07/, sales receipt/P08/, NCG analysis report/P13/, and emission reduction spread sheet/P04/, shutdown/outages regarding the monitoring were fully checked by the verification team. All evidences are clearly identifiable and assessed to be correct. It could be evidenced that the monitoring system ensures for continuous operation with some outage for about 1015.20 hours. Due to malfunctioning of Ethernet LAN of the revenue meter, the project proponent has recorded energy generation details from PLN owned back up meter. Hence this can be considered to be valid and the source of data presented for the period from 2012-02-16 to 2012-06-01 is valid and correct. For delay in calibration the PP has applied error factor in a conservative manner while calculating emission factor. Hence all the value applied for emission reduction calculation is found to be accurate and conservative.

☒ CAR-03, CL-02 and CL-04 are raised and closed successfully.

4.3 Quality of evidence to determine emission reductions or Removal

It is evident from the monitoring data that the monitoring system ensures for continuous operation, with planned and forced shut down during the third monitoring period.

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. These were verified during the site visit and found that proper procedures were adopted for data handling.

The PP has submitted the sales invoice report from the monthly generation records/P07/ for the monitoring period. The electricity generation details provided in the emission reduction calculation sheet are cross verified and found to be line with the monthly electricity report/P08/ attested by the PLN and PO.

The PO revenue meters are to be calibrated once in 2 years as per the requirements of PPA/P11/ which

is in line with the UNFCCC (EB 55, Annex 35, Para 17 C) and validated VCS-PD/B02/. The calibration records for the meters were checked by the verification team and found to be correct with some delays. There was a calibration delay identified during the third verification period for the unit#2. In addition there is a change in revenue meter for Unit#1 has been reported. The same has been verified from the calibration records and found to be valid and correct. However there was a swap of energy meter between Unit#1 and Unit#3 during the third verification period which was discussed during the site visit and clarified that the swap improves the qualitative information and reduced the deviation between the data generated by Project owner revenue meter and PLN owned back up meter. During site visit, the calibration certificate of steam flow meter has been analysed and the competency of the person in charge for doing the calibration of steam flow meter is checked by reviewing the qualification records of the person. Since the calibration of steam flow meter is internal, the DOE has interviewed the person in charge for doing the calibration to find the quality of generated report. All other calibration is done external by an accredited laboratory. Hence the DOE confirms that the source of data generated is more qualitative and quantitative, no information gaps or assumptions are applied in the emission reduction calculation during the third verification period.

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. These were verified during the site visit and found that proper procedures were adopted for data handling.

Monitoring Parameter:

During the verification, all relevant monitoring parameters (as listed in Section 3.2 and 3.3 of the VCS PD/B02/) have been verified with regard to the appropriateness of the applied measurement / determination method, the correctness of the values applied for ER calculation, the accuracy, and applied QA/QC measures. The results as well as the verification procedure are described parameter-wise in the project specific verification checklist.

After appropriate corrections were carried out by the project participant it can be confirmed that all monitoring parameters have been measured / determined without material misstatements and are in line with all applicable standards and relevant requirements.

The audit team verified following documents and respective parameters:

- Monthly sales receipt for the supply of power to JAMALI grid/P08/ for each month covering the monitoring period
- Monthly energy generation report/P07/
- Ex-ante emission factor as per the validated VCS PD/B02/
- Ex-ante validated values of $EG_{\text{historical}}$, $DATE_{\text{BaselineRetrofit}}$, GWP_{CH_4} , Density of diesel, NCV of different type of fuel and its CO_2 emission factor taken from IPCC/B02/.
- Calibration records/P05/
- Daily log records/P15/, fuel consumption details/P12/, NCG analysis reports/P13/, shutdown records/P09/ etc

All the figures as per the monitoring plan were cross-checked by the verification team against basic monitored data and the calculations were found to be correct.

The key monitoring parameter with influence on the calculation of the emission reductions is the net power exported to the JAMALI grid. The power is measured with an accuracy and duly calibrated class 0.2 energy meter/P05/.

All records needed for monitoring are archived in line with the requirements of the registered monitoring plan. No significant, lack of evidence and missing data were detected during on-site verification/P09/. However it was identified that there was an inconsistency in the no of outages hours mentioned in the MR for some of the months. A clarification is raised and closed successfully.

Referring to § 184 (a.ii), § 184 (b.vii), §187, § 205 (c), §206 and §208 (b) of VVM version 01.2, the below tables provide a short summary on the verification of every parameter listed in the monitoring plan.

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of VCS-PD):	MS_y - Quantity of steam produced during the year 'y'
Measuring frequency:	Continuously measured (Hourly)
Reporting frequency:	Continuously measured and Yearly reported
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Steam Flow meter
Is accuracy of the monitoring equipment as stated in the VCS-PD? If the VCS-PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	The accuracy of steam flow meter was mentioned in the VCS-PD. The accuracy class of 0.25% installed for the monitoring of quantity of steam supplied represents the good monitoring practice and is in line with the requirements of monitoring plan.
Calibration frequency /interval:	Once in a year
Is the calibration interval in line with the monitoring plan of the VCS-PD? If the VCS-PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Calibration certificates issued internally after carrying out the calibration of steam flow meters were verified and all the calibration results of steam flow meter belong to this project are within the permissible error of 0.25%. During third verification, the calibration frequency is followed properly with some delay in calibration and the error has been applied conservatively while calculating project emissions.
Company performing the calibration:	PT. Indonesia Power

Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is (are) calibration(s) valid for the whole reporting period?	Yes, there was no delay in calibration identified during the third monitoring period.
If applicable, has the reported data been cross-checked with other available data?	Not applicable. However the DOE has cross verified the daily report data with the log records maintained by PT. Indonesia Power.
How were the values in the monitoring report verified?	The steam flow data recorded in electronic format is verified against daily log records. The same has been provided in the ER sheet/P04/ which is verified and found to be correct.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS-PD.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA, since there is no major trip, scaling in steam pipeline etc identified during third verification period which can affect the steam flow measurement calculation.

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of VCS-PD):	W_{main,CO_2} - Average mass fraction of carbon dioxide in the produced steam (non-dimensional)
Measuring frequency:	Once in four month
Reporting frequency:	Every four month
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Gas analysis using Gas chromatography in external laboratory
Is accuracy of the monitoring equipment as stated in the VCS-PD? If the VCS-PD does	Non-condensable gases sampling was carried out at the steam field-power plant interface using ASTM

not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling phase steam only) as prescribed in the Monitoring Methodology ACM0002 version 07.
Calibration frequency /interval:	Analysis done once in four month as per the methodology
Is the calibration interval in line with the monitoring plan of the VCS-PD? If the VCS-PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Analysis is carried out as per the methodology and monitoring plan requirements of the registered VCS PD.
Company performing the calibration:	PT. Geoservices (Ltd)
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	NCG analysis report is valid for the whole reporting period and there is no delay found during the current verification period.
Is (are) calibration(s) valid for the whole reporting period?	NCG analysis report is valid for the whole reporting period and there is no delay found during the current verification period.
If applicable, has the reported data been cross-checked with other available data?	The Non-Condensable Gases (NCG) sampling and analysis is performed every four months, as per the methodology requirement. The analysis is done by PT. Geoservices (Ltd) with a supervision of Gunung Salak Geothermal Power Plant Laboratory.
How were the values in the monitoring report verified?	Based on the NCG analysis report submitted by the PP. The same has been provided in the ER sheet/P04/ which is verified and found to be correct.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS-PD.

In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA, since all the data are available without material misstatement.
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Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of VCS-PD):	W_{main,CH_4} - Average mass fraction of methane gas in the produced steam (non-dimensional).
Measuring frequency:	Once in four month
Reporting frequency:	Every four month
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Gas analysis using Gas chromatography in external laboratory
Is accuracy of the monitoring equipment as stated in the VCS-PD? If the VCS-PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	Non-condensable gases sampling was carried out at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling phase steam only) as prescribed in the Monitoring Methodology ACM0002 version 07.
Calibration frequency /interval:	Analysis done once in four month as per the methodology
Is the calibration interval in line with the monitoring plan of the VCS-PD? If the VCS-PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Analysis is carried out as per the methodology and monitoring plan requirements of the registered VCS PD.
Company performing the calibration:	PT. Geoservices (Ltd)
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	NCG analysis report is valid for the whole reporting period and there is no delay found during the current verification period.

Is(are) calibration(s) valid for the whole reporting period?	NCG analysis report is valid for the whole reporting period and there is no delay found during the current verification period.
If applicable, has the reported data been cross-checked with other available data?	The Non-Condensable Gases (NCG) sampling and analysis is performed every four months, as per the methodology requirement. The analysis is done by PT. Geoservices (Ltd) with a supervision of Gunung Salak Geothermal Power Plant Laboratory.
How were the values in the monitoring report verified?	Based on the NCG analysis report submitted by the PP. The same has been provided in the ER sheet/P04/ which is verified and found to be correct.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS-PD.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA, since all the data are available without material misstatement.

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of VCS-PD):	EG _y - Net electricity delivered to the grid by the project activity
Measuring frequency:	Continuously measured
Reporting frequency:	Continuously measured on hourly basis and Monthly report prepared
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Revenue meter
Is accuracy of the monitoring equipment as stated in the VCS-PD? If the VCS-PD does	The accuracy of energy meter was mentioned in the registered PDD. The accuracy class of 0.2 installed

not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	for the monitoring of electricity represents the good monitoring practice and is in line with the requirements of VCS-PD
Calibration frequency /interval:	Once in 2 year
Is the calibration interval in line with the monitoring plan of the VCS-PD? If the VCS-PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Calibration certificates issued by accredited laboratory after carrying out the calibration of energy meters were verified and all the calibration results of energy meter belong to this project are within the permissible error of 0.2. During third verification, the calibration frequency as mentioned in the validated PD is followed once in 2 year with some delay for the Unit#2 energy meter.
Company performing the calibration:	Laboratory of Calibration - PT. PLN (Persero)
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is (are) calibration(s) valid for the whole reporting period?	Yes, there was delay in calibration identified during the third monitoring period for Unit#2 in the year 2010.
If applicable, has the reported data been cross-checked with other available data?	The DOE has cross verified the electricity sales receipts with monthly generation report.
How were the values in the monitoring report verified?	Electricity produced is measured by a watt-hour meter (connected to a digital control system and recorded continuously), which can measure both power delivered to the grid and received from the grid. Therefore net electricity export is the difference between export and import by the project activity and is measured and calculated.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS-PD.

In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	There was no information gap identified during the third verification period. However because of SWAP of energy meter between Unit#1 and Unit#3, the meter readings during the period of swapping has been recorded from the PLN owned energy meter. The period for which the energy meter was 2012-02-01 to 2012-06-01.
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Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of VCS-PD):	EG _{imp} - Electricity imported from the grid
Measuring frequency:	Continuously measured
Reporting frequency:	Continuously measured on hourly basis and Monthly report prepared
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Revenue meter
Is accuracy of the monitoring equipment as stated in the VCS-PD? If the VCS-PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	The accuracy of energy meter was mentioned in the registered PDD. The accuracy class of 0.2 installed for the monitoring of electricity represents the good monitoring practice and is in line with the requirements of VCS-PD
Calibration frequency /interval:	Once in 2 year
Is the calibration interval in line with the monitoring plan of the VCS-PD? If the VCS-PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	Calibration certificates issued by accredited laboratory after carrying out the calibration of energy meters were verified and all the calibration results of energy meter belong to this project are within the permissible error of 0.2. During third verification, the calibration frequency as mentioned in the validated PD is followed once in 2 year with some delay for the Unit#2 energy meter.
Company performing the calibration:	Laboratory of Calibration - PT. PLN (Persero)
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	Yes
Is(are) calibration(s) valid for the whole	Yes, there was delay in calibration identified during

reporting period?	the third monitoring period for Unit#2 in the year 2010.
If applicable, has the reported data been cross-checked with other available data?	The DOE has cross verified the electricity sales receipts with monthly generation report.
How were the values in the monitoring report verified?	Electricity produced is measured by a watt-hour meter (connected to a digital control system and recorded continuously), which can measure both power delivered to the grid and received from the grid. Therefore net electricity export is the difference between export and import by the project activity and is measured and calculated.
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS-PD.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	There was no information gap identified during the third verification period. However because of SWAP of energy meter between Unit#1 and Unit#3, the meter readings during the period of swapping has been recorded from the PLN owned energy meter. The period for which the energy meter was 2012-02-01 to 2012-06-01.

Monitoring Parameter Requirement	Assessment/ Observation by the DOE
Data / Parameter: (as in monitoring plan of VCS-PD):	FC_{i,y} . Amount of diesel fuel used in the geothermal power plant operation
Measuring frequency:	Fuel consumption is recorded monthly
Reporting frequency:	Monthly
Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)	Yes
Type of monitoring equipment:	Total Liters consumed because of operation of DG set is converted to Tonnes using specific fuel consumption as per the monitoring plan of the registered VCS PD.

Is accuracy of the monitoring equipment as stated in the VCS-PD? If the VCS-PD does not specify the accuracy of the monitoring equipment, does the monitoring equipment represent good monitoring practice?	NA
Calibration frequency /interval:	NA
Is the calibration interval in line with the monitoring plan of the VCS-PD? If the VCS-PD does not specify the frequency of calibration, does the selected frequency represent good monitoring practice?	NA
Company performing the calibration:	NA
Did calibration confirm proper functioning of monitoring equipment? (Yes / No):	NA
Is(are) calibration(s) valid for the whole reporting period?	NA
If applicable, has the reported data been cross-checked with other available data?	Verified from log records for fuel consumption of DG set
How were the values in the monitoring report verified?	Yes
Does the data management (from monitoring equipment to emission reduction calculation) ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place?	Yes, all the applicable QA/QC procedures are carried out as described in monitoring plan of the registered VCS-PD.
In case only partial data are available because activity levels or non-activity parameters have not been monitored in accordance with the registered monitoring plan, has the most conservative assumption theoretically possible been applied or has a request for deviation been approved?	NA

Accuracy of equipment

The DOE has verified the calibration records of the measuring instrument namely energy meter and steam flow meters. The accuracy of measurement of the monitoring equipment was verified during the

site visit. This is according to the requirements monitoring plan. All these measuring instruments have been calibrated as per the VCS-PD during the third verification period. This also confirms to the requirement of § 184(b) (v) of the VVM, version 01.2.

The monitoring equipment's have been installed in the project activity according to registered monitoring plan. The table below summarizes relevant specifications of monitoring equipment's/P05/:

Monitoring Equipment:	PO Revenue Meter	PLN Owned Energy meter	PO Revenue Meter	PLN Owned Energy meter
Unit No	Unit#1	Unit#1	Unit#2	Unit#2
Function:	Net electricity exported to JAMALI Grid	Net electricity exported to JAMALI Grid	Net electricity exported to JAMALI Grid	Net electricity exported to JAMALI Grid
Ownership:	PT. Indonesia Power	PLN Persero	PT. Indonesia Power	PLN Persero
Location:	Interconnection point at the project site	Interconnection point at the project site	Interconnection point at the project site	Interconnection point at the project site
Transaction point:	Project site	Project site	Project site	Project site
Monitored parameter:	EG _{imp} and EG _y	EG _{imp} and EG _y	EG _{imp} and EG _y	EG _{imp} and EG _y
Make:	ION	ION	ION	ION
Serial number:	PT 0806A117-01	MT-1009A635-01	PT 0806A118-01	PT-0802A471-01
Accuracy:	0.2	0.2	0.2	0.2
Previous calibration dates	2008-09-12	2010-12-20	2008-09-12	2010-12-20
Current calibration date:	Meter Changed on 2010-08-10. Details provided below.	2010-12-20	2011-04-20 and 2012-06-01	2010-12-20
Expiration date of calibration:	New Meter was installed on 2010-08-10 and it has to	2015-12-19	2015-05-31	2015-12-19

	be calibrated before 2012-08-09 and the same has been swapped with Unit#3 Revenue meter on 2012-06-01.			
Frequency of calibration:	Once in 2 years	Once in 5 years	Once in 2 years	Once in 5 years

Monitoring Equipment:	PO Revenue Meter	PLN Owned Energy meter	PO Revenue Meter	PO Revenue Meter
Unit No	Unit#3	Unit#3	Unit#1 (Swapped meter of Unit#3)	Unit#3 (Swapped Meter of Unit#1)
Function:	Net electricity exported to JAMALI Grid	Net electricity exported to JAMALI Grid	Net electricity exported to JAMALI Grid	Net electricity exported to JAMALI Grid
Ownership:	PT. Indonesia Power	PLN Persero	PT. Indonesia Power	PT. Indonesia Power
Location:	Interconnection point at the project site	Interconnection point at the project site	Interconnection point at the project site	Interconnection point at the project site
Transaction point:	Project site	Project site	Project site	Project site
Monitored parameter:	EG _{imp} and EG _y	EG _{imp} and EG _y	EG _{imp} and EG _y	EG _{imp} and EG _y
Make:	ION	ION	Schneider Electric	Schneider Electric
Serial number:	PT-0806A119-01	PT-0802A475-01	PT-0806A119-01	MT-1006A500-01
Accuracy:	0.2	0.2	0.2	0.2

Previous calibration dates	2008-09-12 and 2009-11-04	2010-12-20	2008-09-12	2010-08-10
Current calibration date:	Meter Swapped on 2012-06-01 with Unit#1 Revenue meter.	2010-12-20	2009-11-04, 2011-04-20 and 2012-06-01	2012-06-01
Expiration date of calibration:	2014-05-31	2015-12-19	2014-05-31	2014-05-31
Frequency of calibration:	Once in 2 years	Once in 5 years	Once in 2 years	Once in 2 years

Monitoring Equipment:	Steam Flow Meter	Steam Flow Meter	Steam Flow Meter	NCG Analysis
Unit No	Unit#1	Unit#2	Unit#3	NCG Analysis
Function:	Steam Flow recordings	Steam Flow recordings	Steam Flow recordings	Project emission calculation from NCG
Ownership:	PT. Indonesia Power	PT. Indonesia Power	PT. Indonesia Power	PT. Indonesia Power
Location:	Steam Supply Point at project site	Steam Supply Point at project site	Steam Supply Point at project site	Sampling Point at project site
Transaction point:	Project site	Project site	Project site	Project site
Monitored parameter:	Ms,y	Ms,y	Ms,y	W _{CO2} , W _{CH4}
Make:	Endress-Hausser	Endress-Hausser	Endress-Hausser	NA
Serial number:	1LBA01CF001-B01	2LBA01CF001-B01	3LBA01CF001-B01	NA
Accuracy:	0.25	0.25	0.25	

Previous calibration dates	2008-09-08, 2009-07-13, 2010-07-26	2008-09-08, 2009-07-15, 2010-07-27	2008-09-08, 2009-07-14, 2010-07-28	2011-03-22
Current calibration date:	2011-07-25 and 2012-07-25	2011-07-25 and 2012-07-25	2011-07-26 and 2012-07-26	2011-07-21, 2011-11-21 and 2012-03-23, 2012-07-23
Expiration date of calibration:	2013-07-24	2013-07-24	2013-07-25	2012-11-23
Frequency of calibration:	Annually	Annually	Annually	Every Four Months

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. Details on monitoring constraint was verified during the site visit and found that proper procedures were adopted for data handling. The data will be stored for 2 years after the end of crediting period or till the last issuance of VERs for this project activity whichever occurs later.

Assessment of data and calculation of greenhouse gas emission reductions:

The emission reductions are calculated as baseline emissions deducted by project emissions and leakage. The net electrical energy exported to the grid is calculated as the difference between total energy exported minus import. Grid emission factor for the JAMALI grid multiplied by the net electrical exported to the grid results in the baseline emissions/B02/.

As the plant runs with geothermal energy, emission from NCG and usage of diesel during the blackout days are accounted for the calculation of emission reduction. Leakage is considered to be zero as per applied methodology. The original monitoring data to calculate the emission reductions is taken from the monthly sales receipt for the generation and monthly generation report. This data is the basis for the calculation of the emission reductions as given in the spreadsheet

Appropriate calculation methods (i.e. in accordance with ACM 0002, version 07) are applied. The grid emission factor of 0.882 tCO₂/MWh for the JAMALI Grid, Indonesia has been rightly applied in this monitoring period.

Baseline Emissions:

The formula used for the determination of baseline emissions which is consistent with the one in the VCS-PD is:

$$BE_y = (EG_y - EG_{baseline}) EF_{grid,CM,y}$$

$$EG_{baseline} = EG_{historical} \text{ until Date}_{Baseline Retrofit}$$

$$EG_{baseline} = EG_y \text{ on/after Date}_{Baseline Retrofit}$$

Where:

BE_y	Baseline emissions in year y (tCO ₂ /yr)
EG_y	Electricity supplied by the project activity to the grid (MWh)
$EG_{baseline}$	Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.
$EF_{grid,CM,y}$	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”
$EG_{historical}$	Average of historical electricity delivered by the existing facility to the grid (MWh).
$DATE_{BaselineRetrofit}$	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

The baseline emissions (BE_y) during this monitoring period are 297,491 tCO₂.

Project Emission:

Project emissions as described in the ACM0002 version07 are considered from:

- Fugitive carbon dioxide and methane emissions due to release of non-condensable gases from the produced steam (PES_y); and

$$PE_y = PES_y + PEFF_y$$

$$PES_y = (w_{main,CO2} + w_{main,CH4} \times GWP_{CH4}) M_{s,y}$$

Where:

PE_y	Project emissions in year y (tCO ₂ /yr)
PES_y	Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y (tCO ₂ /yr)

$PEFF_y$	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO_2/yr)
W_{main,CO_2}	Average mass fraction of carbon dioxide in the produced steam (non-dimensional)
W_{main,CH_4}	Average mass fraction of methane gas in the produced steam (non-dimensional)
GWP_{CH_4}	Global warming potential of methane valid for the relevant commitment period (tCO_2/tCH_4)
$M_{s,y}$	Quantity of steam produced during the year 'y' (tonnes)

The project emissions (PE_y) during this monitoring period are 80,816 tCO_2 .

Leakage Emission:

No leakage is considered as per the methodology.

Emission Reduction:

Summary of Emission Reductions/P04/ using the formula $ER_y = BE_y - PE_y - LE_y$ during this monitoring period:

Capacity (MW)	Verification period	Net Electricity Exported(in MWh)	Grid Emission Factor (tCO_2/MWh)	Baseline Emissions (tCO_2e)	Project emissions	Emission Reductions (tCO_2e)
3 x 55 MW	2011-04-01 to 2012-07-31 (Both days included)	1,929,506.37	0.882	284,551	80,816	203,735

Thus it is confirmed that the ER calculation is transparent, conservative and correct. The supporting documents including the monthly energy report, sales invoice receipts, calibration records, NCG analysis report, steam flow data, log records etc were verified and found to be acceptable with regard to the requirements of the methodology and the VCS PD.

All the energy meters are to be calibrated once in 2 years as per the industrial standards and validated VCS PD /B02/. There was some delay in calibration of energy meters/P05/ for unit#2 during the third monitoring period and proper error factor has been applied as per the Guideline. Hence, it is concluded by the DOE that all the energy meters has been calibrated once in 2 year and the calibration certificate is verified and the calibration details of the same has been added in the MR /P02/.

All the monitored data are archived in electronic form. The data will be kept for the whole crediting

period and additional 2 years as given in the PD thus complying the requirements of § 17 (a) of “General Guidelines to SSC CDM methodologies”, for SSC-CDM project activities.

Final Assessment

Proper data management including data acquisition, aggregation and data management system is being followed at the project site.

All records needed for monitoring are archived in line with the requirements of the validated monitoring plan /VCS-PD/. Updated SOP manual submitted by the PP includes all the emergency preparedness for unrecorded data and major break down. It is evident from the monitoring data that the monitoring system ensures for continuous operation.

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. These were verified during the site visit and found that proper procedures were adopted for data handling.

The monitoring personnel at site are well trained and follow reproducible routines as was evident during the site visit. Members of monitoring team were interviewed. Procedure for training and maintenance of critical equipment’s were discussed during site visit. Day to day operation is supervised by the technically qualified site engineers who have adequate knowledge. They have the responsibility to supervise various technical staff for around the clock who engage in operation and maintenance of project activity. Training records for the monitoring personnel were reviewed during site visit/P16/. The training would be provided to the concerned personnel as required. Thus, they are competent to carry out the relevant tasks with sufficient accuracy. All necessary monitored and measured raw data were checked during on-site verification (Ref Section 6 of this report).

☒ CAR-02, CL-01 and CL-03 are raised and closed successfully.

4.4 Management and Operational System

The allocation of responsibilities is documented in a written form and is followed as described in the SOP and VCS PD. This has been verified. Routines for the archiving of data are defined and documented. Calculations are laid down in the monitoring report and are in line with VCS PD and SOP.

The authority of the project site is given to the Senior Environment Expert, Mrs. Anna Reani. She is responsible for the assessment of all monitoring parameters on yearly basis in a report format and discuss with South Pole if corrections are needed in the monitoring SOP. Mr. Doni Bakar, who is the VCS manager responsible for storing of monthly generated report and prepare yearly report. Mr. Rinduan is a VCS coordinator responsible monthly report preparation in excel sheet. Operator works on shifts are responsible for hourly recording of steam flow, electricity generation date, blackouts, power shut down and emergency preparedness. Mr. Yuansah is responsible for the chemical laboratory for NCG calculation mainly for VCS purpose. All these are mentioned in the updated SOP and it is verified and found to be OK.

Final Assessment

All internal data are subjected to QA/QC measures. All monitored data are archived in Physical and Electronic form. Details on monitoring constraint was verified during the site visit and found that proper procedures were adopted for data handling. The data will be stored for 2 years after the end of crediting period or till the last issuance of VERs for this project activity whichever occurs later.

All meters undergo calibration regularly and the reports were verified and found to be in accordance with the wheeling agreement and monitoring plan mentioned in the VCS PD. The MR mentions in detail the calibration procedures adopted and meter details including calibration dates and their delays. A conservative approach has been taken to calculate the ER. The monitoring report therefore satisfies the calibration procedure and the calibration frequency.



No CAR/CL is raised.

5 VERIFICATION CONCLUSION

PT. Indonesia Power has commissioned the TÜV Rheinland (China) Ltd to carry out the verification of the Project “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia” in India with regard to the requirements of VCS Version 3.3 Standard.

Reporting Period: From 2011-04-01 to 2012-07-31 (both days included)

In the course of the verification 3 Corrective Action Requests (CARs), 4 Clarification Requests (CLs) were raised and closed successfully. No FAR is raised.

The verification is based on the draft monitoring report/P01/, revised monitoring report/P02/, the monitoring plan as set out in the validated PD/B02/, the validation report/B02/, emission reduction calculation spreadsheet/P04/ and supporting documents made available to the TÜV Rheinland (China) Ltd by the project participant.

In detail the conclusions can be summarized as follows:

- All operations of the project are implemented and installed as planned and described in the validated project description.
- The monitoring plan is in accordance with the applied approved methodology, i.e., ACM 0002, version 07.
- The installed equipment essential for measuring parameters required for calculating emission reductions is calibrated appropriately with some delays.
- The monitoring system is in place and functional. The project has generated GHG emission reductions.

As the result of the 3rd periodic verification, the verifier confirms that the GHG emission reductions are calculated without material misstatements in a conservative and appropriate manner. TÜV Rheinland (China) Ltd herewith confirms that the project has achieved emission reductions in the above mentioned reporting period as follows:

Year	BE _y	PE _y	LE _y	Emission Reductions ER _y (tCO _{2e})
2011-04-01 to 2011-12-31	144,206	51,866	0	92,340
2012-01-01 to 2012-07-31	140,345	28,950	0	111,395
Total	284,551	80,816		203,735

6 REFERENCES:

Ref no.	Reference Document		
/P01/	Monitoring report, version 01 dated 2012-09-26 for the monitoring period from 2011-04-01 to 2012-07-31 (both days included)		
/P02/	Monitoring report, version 2.3 dated 2012-12-24 for the monitoring period from 2011-04-01 to 2012-07-31 (both days included)		
/P03/	Emission reduction spread sheet version 01 w.r.t initial MR, version 01.		
/P04/	Emission reduction spread sheet version 2.2 w.r.t the final MR. version 2.3		
/P05/	S.No	Equipment	Description
	1	Electricity Revenue Meter Unit #1 (01/04/2009 – 10/08/2010) For EG _y and EG _{imp}	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #1: PT 0806A117-01 Class of Accuracy: 0.2 Date of Calibration: 12/09/2008 Range: 5 A; 57.7 V; 50 Hz
	2	Electricity Revenue Meter Unit #1 (10/08/2010 – 16/02/2012 at 10:00 AM) For EG _y and EG _{imp}	Name: Static Energy Meter Manufacturer: Schneider Electric Type: ION 8600 Unit #1: MT-1006A500-01 Class of Accuracy: 0.2 Date of Calibration: 10/08/2010, 20/04/2011 Range: 2.5 A; 57 - 277 V; 50 Hz
	3	PLN Owned Back Up Electricity Revenue Meter Unit #1 (16/02/2012 at 10:01 AM – 01/06/2012 at 10:00 AM)	Name: Static Energy Meter Manufacturer: Schneider Electric Type: ION 8600 Unit #1: MT-1009A635-01 Class of Accuracy: 0.2 Date of Calibration: 20/12/2010 Range: 2.5 A; 57 - 277 V; 50 Hz

		For EG _y and EG _{imp}	
4	Electricity Revenue Meter Unit #1 (01/06/2012 at 10:01 AM onwards) For EG _y and EG _{imp}	Name: Static Energy Meter Manufacturer: Schneider Electric Type: ION 8600 Unit #1: PT 0806A119-01 Class of Accuracy: 0.2 Date of Calibration: 01/06/2012 Range: 0.05 - 20 A; 57 - 277 V; 50 Hz	
5	Electricity Revenue Meter Unit #2 (01/04/2009 - 16/02/12 at 10:00 AM) For EG _y and EG _{imp}	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #2: PT 0806A118-01 Class of Accuracy: 0.2 Date of Calibration: 12/09/2008 & 20/04/2011 Range: 5 A; 57.7 V; 50 Hz	
6	PLN Owned Back Up Electricity Revenue Meter Unit #2 (16/02/2012 at 10:01 AM – 01/06/2012 at 10:00 AM) For EG _y and EG _{imp}	Name: Static Energy Meter Manufacturer: Power Measurement Type: ION 8600 Unit #2: PT-0802A471-01 Class of Accuracy: 0.2 Date of Calibration: 20/12/2010 Range: 2.5 A; 57 - 277 V; 50 Hz	
7	Electricity Revenue Meter Unit #2 (01/06/2012 at 10:01 AM onwards) For EG _y and EG _{imp}	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #2: PT 0806A118-01 Class of Accuracy: 0.2 Date of Calibration: 01/06/2012 Range: 5 A; 57.7 V; 50 Hz	
8	Electricity Revenue Meter Unit #3 (01/04/2009 -	Name: Static Energy Meter Manufacturer: ION Type: 8600	

	16/02/2012 at 10:00 AM) For EG _y and EG _{imp}	Unit #3: PT 0806A119-01 Class of Accuracy: 0.2 Date of Calibration: 12/09/2008 & 04/11/2009 Range: 0.05 - 20 A; 57 - 277 V; 50 Hz
9	PLN Owned Back Up Electricity Revenue Meter Unit #3 (16/02/2012 at 10:01 AM – 01/06/2012 at 10:00 AM) For EG _y and EG _{imp}	Name: Static Energy Meter Manufacturer: Power Measurement Type: ION 8600 Unit #3: PT-0802A475-01 Class of Accuracy: 0.2 Date of Calibration: 20/12/2010 Range: 2.5 A; 57 - 277 V; 50 Hz
10	Electricity Revenue Meter Unit #3 (01/06/2012 at 10:01 AM onwards) For EG _y and EG _{imp}	Name: Static Energy Meter Manufacturer: Schneider Electric Type: ION 8600 Unit #3: MT-1006A500-01 Class of Accuracy: 0.2 Date of Calibration: 01/06/2012 Range: 2.5 A; 57 - 277 V; 50 Hz
11	Steam Flow Meter Unit #1 For M _{S,y}	Name: Main Steam Flow Meter Transmitter Manufacturer: Endress-Hausser Model No.: FMD78 Instrument No.: 1LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC Scale: 0 ~ 100 % Accuracy: 0.25 % Date of Calibration: 08/09/2008, 13/07/2009, 26/07/2010, 25/07/2011, & 25/07/2012
12	Steam Flow Meter Unit #2	Name: Main Steam Flow Meter Transmitter Manufacturer: Endress-Hausser Model No.: FMD78

		For M _{S,y}	Instrument No.: 2LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC Scale: 0 ~ 100 % Accuracy: 0.25 % Date of Calibration: 08/09/2008, 15/07/2009, 27/07/2010, 25/07/2011, & 25/07/2012
	13	Steam Flow Meter Unit #3 For M _{S,y}	Name: Main Steam Flow Meter Transmitter Manufacturer: Endress-Hausser Model No.: FMD78 Instrument No.: 3LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC Scale: 0 ~ 100 % Accuracy: 0.25 % Date of Calibration: 08/09/2008, 14/07/2009, 28/07/2010, 26/07/2011, & 26/07/2012
/P06/	1. Commissioning certificate from “DEPARTMEN ENERGI DAN SUMBERDAYA MINERAL, REPUBLIK INDONESIA”, letter vide Nomor: 1346/44/600.4/2006 for Unit#1 2. Commissioning certificate from “DEPARTMEN ENERGI DAN SUMBERDAYA MINERAL, REPUBLIK INDONESIA”, letter vide Nomor: 1347/44/600.4/2006 for Unit#2 3. Commissioning certificate from “DEPARTMEN ENERGI DAN SUMBERDAYA MINERAL, REPUBLIK INDONESIA”, letter vide Nomor: 1348/44/600.4/2006 for Unit#3		
/P07/	Monthly Energy generation report issued by PT. PLN PERSERO for the monitoring period from 2011-04-01 to 2012-07-31		
/P08/	Invoice copy of the sales of electricity to PT.PLN PERSERO for the third verification period from 2011-04-01 to 2012-07-31		
/P09/	Site visit data collection and photograph taken during the site visit (2012-11-26 and 2012-11-27). The data collections are as follows:		

	1. Interview with PP personnel, site In charge personnel's and consultant about the collection, archiving, storage of data w.r.t electricity generation, and enquiry on any change in monitoring personnel/monitoring equipment. 2. Training procedures and training records of monitoring personnel's 3. Details of monitoring meters such as make, accuracy class, serial number, daily recordings etc 4. SOP 5. Calibration procedures 6. QA/QC measures adopted by PT. Indonesia Power 7. Emergency preparedness and incidents such as downtime, forces shut down etc. 8. Discussion about DCS operation and online recording of data.
/P10/	Technical specification of the installed equipment's
/P11/	1. Power Purchase Agreements between PERJANJIAN JUAL BELI TENAGA LISTRIK TAHUN 2003 and PT.INDONESIA POWER for all the three units 1,2&3, Nomor 405.PJ/o63/IP/2003 2. Power Purchase Agreements between PERJANJIAN JUAL BELI TENAGA LISTRIK TAHUN 2003 and PT.INDONESIA POWER for all the three units 1,2&3, Nomor 019.PJ/o63/IP/2008.
/P12/	Log book details of the diesel consumption for the monitoring period from 2011-04-01 to 2012-07-31.
/P13/	NCG analysis certificate for the period from 2011-03-22, 2011-07-21, 2011-11-21 and 2012-03-23, 2012-07-23.
/P14/	• Updated SOP dated 2003-01-23 • Updated SOP dated 2011-06-22 • Updated SOP dated 2012-06-22
/P15/	Log book details of the steam flow for the monitoring period from 2011-04-01 to 2012-07-31.
/P16	Training certificate for the period from 2011-04-01 to 2012-07-31.
/P17	Working Instruction: Diesel Generator Operation dated 2011-08-01 Diesel Fire Fighting Pump Operation dated 2011-08-01
/P18/	Emission Factor calculation sheet for JAMALI Grid, Indonesia fixed ex-ante.
/P19/	Three partied SOP for Carbon Credit Monitoring Plan for Capacity Upgrade of Gunung Salak

	Geothermal Power Plant Project, Indonesia dated 2009-10-20.
/P20/	Yearly report on shut down hours covering the third verification period.
/P21/	Minister of Energy and Mineral Resources Regulation No. 3 issued in 2007 regarding Java-Madura-Bali (JAMALI) with English translation.

Table 6-2: Background investigation and assessment documents

Reference	Document
/B01/	Indicative simplified baseline and monitoring methodologies for selected large-scale CDM project activity categories (Version 7).
/B02/	Final validation report w.r.t “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia”
/B03/	Final version (Version 7) of the VCS PD w.r.t “Capacity Upgrade of Gunung Salak Geothermal Power Plant Project, Indonesia” dated 2009-07-10. validated project document /B02/ dated 2009-07-10, Validation report dated 2009-07-14 /B02/ the Validation statement dated 2009-07-14/B02/
/B04/	1. First verification monitoring report dated 2009-10-27/B03/, first verification statement dated 2009-10-27/B03/ and first verification report dated 2009-10-26/B03/ 2. Second verification monitoring report dated 2012-04-24/B03/, second verification statement dated 2012-06-04/B03/ and first verification report dated 2012-06-04/B03/.
/B05/	Tool to calculate the emission factor for an electricity system (Version 01.1)
/B06/	2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book
/B07/	1. Data was obtained from PLN statistics website (Table 23 and Table 24 for all years). Data for power purchased from Independent Power Producers (IPPs) was lumped as a single generation data, except for year 2005 and 2006 2. Data for 2006 includes all power plants including individual IPPs. Data for 2005 is IPP

Reference	Document
	generations data to be used as complimentary information with published data for 2005 contained in Table 23 and Table 24 of PLN statistic website
/B08/	Greenhouse gases – Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals Greenhouse gases – Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements Greenhouse gases – Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions
/B09/	Greenhouse gases – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition
/B10/	Voluntary Carbon Standard Version 3.3
/B11/	VCS MR Template
/B12/	Validation and Verification Manual (October 2012, VCS)
/B13/	Guidelines for assessing compliance with the calibration frequency requirements

Table 7: List of Requests for Corrective Action (CAR) and Clarification (CL)

No.	Type of request	Observation	Summary of project owner response	Verification team conclusion
1.	/CAR-01/	Latest version of the template is not used. Also please submit the word copy of the MR in track change mode.	PP response#1: The latest version of VCS Monitoring Report template v3.2 has been used. The word copy version of MR is being submitted.	DOE Assessment#1:/P02/,B11/ The revised MR has applied the latest version of VCS monitoring report template. The same is verified and found to be valid and correct. CAR-01 is closed successfully.
2.	/CAR-02/	Change in energy meter for Unit#1 is not explained in the MR for meter number MT-1006A500-01.	PP response#1: The old revenue meter Unit #1 was replaced due to memory of revenue meter (upgraded revenue meter). The explanation of revenue meter Unit #1 (MT 1006A500-01) change has been clearly mentioned in section 2.1 and 3.2 of MR.	DOE Assessment#1:/P02/,P05/ The change of energy meter was analysed during the site visit and found that the meter was upgraded from 2 MB storage to 10 MB storage. The new meter serial number was verified during the site visit and confirmed to be correct. CAR-02 is closed

				successfully.
3.	CAR-03	The emission reduction is not conservatively estimated for the year 2011.	PP response#1: The Egbaseline values have been written back. The BEy should not be zero if it is less than baseline, hence the zero values have been revised to show the actual figure. The negative value of BEy have been calculated added in this revised MR. Hence, the total ERs have been reduced from 216,675 tCO ₂ become 203,735 tCO ₂ .	DOE Assessment#1:/P02/,/P05/ The explanation provided by the PP is accepted based on the conservative principle. Hence CAR-03 is closed.
4.	/CL-01/	Explanation is not transparent under section 2.1. Is the meter completely changed and replaced with new meter? Or All the meter are combined in to single meter. Please clarify.	PP response#1: As of 01/06/2012, management decided to swap revenue meter Unit #1 for Unit #3 and vice versa. This decision was made to minimize electricity generation deviation between revenue and back-up meters in Unit #3. The revenue meters swap did not involve any new revenue meter except 2 existing revenue meters used in Unit #1 and #3. Therefore, since 01/06/2012, the serial number of revenue meters Unit #1 and Unit #3 are PT	DOE Assessment#1:/P02/,/P09/ It is verified during the site visit that there is no installation of new meter at the project site. There is a swap of energy meter between Unit #1 and Unit #3. The reason for the same has been analyzed and found that it is a trial and error method to swap the meters to minimize the deviation between the revenue meter of the PP and back up meter.

			0806A119-01 and MT 1006A500-01 subsequently. In addition to that, besides revenue meters swap, there was not any other activity such as a combined single meter because electricity generation from each unit is still measured by one revenue meter independently as per registered VCS PD. Additional and clearer explanation has been incorporated in the MR version 2 to avoid misinterpretation.	This doesn't have any impact on monitoring plan or emission reduction. The serial number of the energy meters are verified and found to match with the details present in the revised MR and calibration records. CL-01 is closed successfully.
5.	/CL-02/	It was identified during the site visit that there was an updated SOP. The explanation about the same is not mentioned in the MR. Also; please submit the amended section of SOP to the DOE for verification.	PP response#1: Additional explanation of SOP revision since June 2011 has been added in section 3.2 of revised MR v.2.1. The updated SOP dated June 2011 is being submitted to DOE.	DOE Assessment#1/P02, /P14/ The explanation about the additional SOP is included in the revised MR. The same is verified and found that the SOP is updated to include meter readings of PLN owned energy meter. Hence CL-02 is closed successfully.
6.	/CL-03/	Frequency of calibration for PLN owned energy meter is not mentioned in the MR.	PP response#1: The frequency of calibration for PLN owned back-up meter has been added in section 3.2 of MR. The	DOE Assessment#1:P02, /P21/ The information w.r.t the calibration frequency of PLN

			Minister of Energy and Mineral Resources Regulation No. 3 issued in 2007 regarding Java-Madura-Bali (JAMALI) with English translation is being submitted to DOE.	owned meter is now provided in the revised MR and it is found to be once in 5 years which is as per the national standard. The same is verified and found to be correct. CL-03 is closed successfully.
7.	/CL-04/	During cross checking of shutdown hour log records against the information presented in the MR, it was noted that the actual shut down hour details for certain months are not exactly matching with the total hours. Please clarify.	PP response#1: After carefully re-checking ER calculation and summary of operation and shutdown hours spreadsheet, it was found out that some forced and planned shutdown data are mistakenly inserted in the ER calculation and the operation and shutdown hours summary spreadsheet. ER calculation and operation and shutdown hours summary have been revised to clearly depict all shutdown hours based on planned and forced shutdown reports. Hence, the discrepancies have been successfully eliminated and now yearly summary showed in both documents are the same. The correct values have	DOE Assessment#1: /P02/, /P20/ The annual shut down hour report submitted by the PP is thoroughly analyzed and the information provided w.r.t the outages are found to be valid and correct. CL-04 is closed successfully.

			already inserted in the revised MR. The operation and shutdown hours summary spreadsheet is being submitted to DOE.	
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Annex-I – Abbreviations

§	Para
%	Percentage
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction(s)
CL	Clarification request
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
DCS	Digital Control System
DOE	Designated Operational Entity
ESC	Energy Sale Contract
ER	Emission Reductions
FAR	Forward Action Request
GHG	Greenhouse Gas(es)
JAMALI	Jawa-Madura-Bali
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
kW	Kilo Watt
LAN	Local Area Network
LCM	Life Cycle Management
MP	Monitoring Plan
MR	Monitoring Report
MW	Mega Watt
NCG	Non-Condensable Gases
O&M	Operation and Maintenance
PA	Project Activity
PIC	Person in charge
PO	Project Owner
PP	Project Participant
PPA	Power Purchase Agreement
QA/QC	Quality Assurance and Quality control
SCM	Supply Chain Management
S.No	Serial Number
TPM	Total Productive Maintenance
UNFCCC	United Nation Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCS-PD	Verified Carbon Standard Project Document
VVM	Validation and Verification Manual